NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

NUTRIENT MANAGEMENT

(Acre)

CODE 590

DEFINITION

Managing the amount, source, placement, form and timing of the application of nutrients and soil amendments.

PURPOSES

- To budget and supply nutrients for plant production.
- To properly utilize manure or organic by-products as a plant nutrient source.
- To minimize agricultural nonpoint source pollution of surface and ground water resources.
- To protect air quality by reducing nitrogen and/or particulate emissions to the atmosphere
- To maintain or improve the physical, chemical and biological condition of soil.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all lands where plant nutrients and soil amendments are applied that impact natural resources.

CRITERIA

General Criteria Applicable to All Purposes

Plans for nutrient management shall comply with all applicable federal, state, and local laws and regulations.

Plans for nutrient management shall be developed in accordance with policy requirements of the NRCS General Manual Title 450, Part 401.03 (Technical Guides, Policy and Responsibilities) and Title 190, Part 402 (Ecological Sciences, Nutrient Management, Policy); technical requirements of the NRCS Field Office Technical Guide (FOTG); procedures contained in the National Planning Procedures Handbook (NPPH), and the NRCS National Agronomy Manual (NAM) Section 503.

All NRCS employees who review or approve plans for nutrient management shall be certified through the Oklahoma Nutrient Management Course or a certification program acceptable to Oklahoma NRCS. Technical Service Providers (TSPs) and/or non-NRCS employees will be certified through either the above program or through the TechReg website: http://techreg.usda.gov/ when assisting with the implementation of federal conservation programs for which NRCS has national technical responsibility and that include nutrient management. (NRCS General Manual Title 190, Ecological Sciences, Part OK 402.03, Policy for certification)

Plans for nutrient management that are

EXHIBIT 11 PL2-5174417

appropriate NRCS buffer standard and specification.

- To fields with > 15% slope.
- To soils less than 10 inches in depth to parent material.
- On soils that are frequently flooded.
- On soils that are frozen, snow covered, or water saturated.
- On soils where the rock fragments in the surface layer are 3 to 10 inches in diameter and exceed 50% by weight.
- On soils where the rock fragments in the soil surface layer are > 10" in diameter and exceed 25% by weight.
- On soils where the rock fragments are > 10 inches in diameter which covers > 3% of the soil surface and the slope is > 8%. (Soil map unit name will include the description of Extremely Stoney, Extremely Bouldery, or Extremely Rubbly or Very Rubbly)
- On areas eroding at levels greater than the soil loss tolerance, "T", from water erosion or active gullies unless following a conservation plan that will reduce erosion below "T". Use current Oklahoma NRCS soil loss prediction methods.
- On soils that are occasionally flooded. However, waste may be applied between June 20 and September 20 on soils classified as occasionally flooded. Manure may also be applied to soils classified as occasionally flooded between February 1 and April 20 if the area is established to cool season grasses 4 inches in height at the time of application.

Organic Nutrient Application Rates
The application rate for nutrients applied through irrigation shall not create runoff.

A nutrient budget shall be developed to account for all sources of nutrients.

Lime shall be applied, as needed, to adjust soil pH.

Application of material will be applied uniformly to the field.

The following shall also be used when applying manure or organic by-products:

- **Starter Fertilizers** - Starter fertilizers containing nitrogen, phosphorus and/or potassium may be applied to row crops to overcome early stress of the root environment such as a cool, wet soil. Starter fertilizers are applied in the row with the seed or banded along side the seed. OSU guidance recommends no more than 30 lbs of either nitrogen or K_2O per acre or in combination. No more than 90 lbs. per acre of P_2O_5 will be used in a starter fertilizer. These amounts are safe rates at which seed damage should not occur. The amount of starter fertilizer applied will be included in the nutrient budget.
- **Nitrogen Application** – Nitrogen application rates shall match the crop requirement as closely as possible. In some situations, additional nitrogen, from inorganic sources, may be required to supplement the organic sources. Manure maybe applied to a legume crop at a rate equal to the estimated nitrogen removal in the harvested plant biomass.
- **Phosphorus Application** – The maximum planned rates of phosphorus application shall be determined using the Oklahoma Phosphorus Assessment Worksheet ***(Tables 8, Table 9).***

Field Risk Assessment
When manure or other organic by-products are applied, a field-specific assessment of

the potential for phosphorus transport from the field shall be completed. This assessment shall be done using the Oklahoma Phosphorus Assessment ***(Table 8, Table 9).***

The results of the assessment and recommendations shall be discussed with the producer and documented in the plan.

Heavy Metals Monitoring
When sewage sludge is applied, the accumulation of potential pollutants (including arsenic, cadium, copper, lead, mercury, selenium, and zinc) in the soils shall be monitered in accordance with the US Code, Reference 40CFR, Parts 403 and 503, and/or any applicable state and local laws or regulations. The role of monitoring the application of sewage or municipal sludge in Oklahoma is with the Oklahoma Department of Environmental Quality (DEQ). Contact DEQ for information concerning the use of municipal sludge.

Additional Criteria to Minimize Agricultural Non-point Source Pollution of Surface and Ground Water Resources

For water bodies in watersheds identified by the Oklahoma Water Resources Board as Nutrient Limited Waters (NLW) in Appendix A of the Oklahoma Water Standards, an assessment shall be completed for the potential transport of phosphorus when manure or organic by-products are to be applied to a field. The Oklahoma Phosphorus Assessment will be used to make the assessment. The result of the assessment and recommendation shall be discussed with the producer and included in the plan.

Additional Criteria to Protect Air Quality by Reducing Nitrogen and/or Particulate Emissions to the Atmosphere

Incorporate surface applications of solid forms of manure or some commercial fertilizer nitrogen formulations (i.e., Urea) into the soil within 24 hours of application.

When applying liquid forms of manure with irrigation equipment select application conditions when there is high humidity, little/no wind, a forth coming rainfall event, and/or other conditions that will minimize volatilization losses into the atmosphere. The basis for applying manure under these conditions shall be documented in the nutrient management plan.

Handle and apply poultry litter or other dry types of animal manures when weather conditions are calm and there is less potential for blowing and emission of particulates into the atmosphere. The basis for applying manure under these conditions shall be documented in the nutrient management plan.

Additional Criteria to Improve the Physical, Chemical, and Biological Condition of the Soil

Manure or organic by-products incorporated into the soil will improve soil structure. Manure will be incorporated into the soil within 72 hours to reduce nutrient losses. The Crop Rotation (328) standard and specification contains guidance for determining soil condition.

When non-legume crop yields exceed goals by more than 10%, or when a non-legume crop is terminated and returned to the soil as a green manure crop, additional nitrogen may be needed to supplement the nitrogen used by the soil microbes to breakdown the residue and avoid yield reductions.

Estimated nitrogen amounts needed per ton of crop residue are:

Table 8

Annual Waste Application Rates for Non-Nutrient Limited Watershed

Rating	Soil Test P Index	0 – 8% Slope	8 to 15% Slope	0 to 15% Slope
		Soil > 20" Deep	Soil > 20" Deep	Soil 10" to 20" Deep
*Low	0 – 65	Full Rate	Full Rate Split Application	Half Rate
*Moderate	66 – 250	Full Rate	Half Rate	Half Rate
*High	251 – 400	Half Rate	Half Rate	Half Rate
*Very High	> 400	Plant Removal	Plant Removal	Plant Removal
*Severe	*	No Application	No Application	No Application

Rating	Soil Test P Index	Rocks >10" in diameter which cover >3% of the soils surface and <8% slope
*Low	0 – 65	Half Rate
*Moderate	66 – 250	Half Rate
*High	251 – 400	Half Rate
*Very High	> 400	Plant Removal
*Severe	*	No Application

* See Severe Rating-No Application listed below. Check for specific site charactersistics which may deem the field inadequate for manure application.

Waste Application Rates

Full Rate – Not to exceed the Nitrogen requirement of the crop and the following P_2O_5 rates:

1. 200 lbs P_2O_5 per acre when surface applied.
2. 300 lbs P_2O_5 per acre when application is by sprinkler irrigation and managed to prevent runoff from field.
3. 400 lbs P_2O_5 per acre if injected below the soil surface or surface applied and incorporated within 7 days.

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Half Rate – Not to exceed the Nitrogen requirement of the crop and the following P_2O_5 rates:

1. **100 lbs P_2O_5 per acre when surface applied.**
2. **150 lbs P_2O_5 per acre when application is by sprinkler irrigation and managed to prevent runoff from field.**
3. **200 lbs P_2O_5 per acre if injected below the soil surface or surface applied and incorporated within 7 days.**

Split Application – Not to exceed the Nitrogen requirement of the crop

Application will be no more than ½ the allowed P_2O_5 rate per application at least 30 days apart.

Severe Rating - No Application

Do not apply manure or organic by-products in the following situations. Reference the Published County Soil Survey or Section II of the local NRCS Field Office Technical Guide.

- **To areas within 100 feet of a perennial stream, pond, well, or sinkhole, unless an established buffer is present. The width of the buffer will be used as a set back distance for application purposes. The buffer must meet the requirements for design and maintenance established in the NRCS buffer standard and specification.**
- **To areas within 50 feet of an intermittent stream unless an established buffer is present. The width of the buffer will be used as a set back distance for application purposes. The buffer must meet the requirements for design and maintenance established in the NRCS buffer standard and specification.**
- **To fields with > 15% slope.**
- **To soils with less than 10 inches in depth to parent material.**
- **On soils that are frequently flooded.**
- **On soils that are frozen, snow covered, or water saturated.**
- **On soils where the rock fragments in the surface layer are 3 to 10 inches in diameter and exceed 50% by weight.**
- **On soils where the rock fragments in the soil surface layer are > 10" in diameter and exceed 25% by weight.**
- **On soils where the rock fragments are > 10 inches in diameter which covers > 3% of the soil surface and the slope is > 8%.**
- **On areas eroding at levels greater than the soil loss tolerance, "T", from water erosion or active gullies unless following a conservation plan that will reduce erosion below "T". Use current Oklahoma NRCS erosion prediction methods.**
- **On soils that are occasionally flooded. However, waste may be applied between June 20 and September 20 on soils classified as occasionally flooded. Manure may also be**

applied to soils classified as occasionally flooded between February 1 and April 20 if the area is established to cool season grasses 4 inches in height at the time of application.

Table 9

Annual Waste Application Rates for Nutrient Limited Watershed

Rating	Soil Test P Index	0 – 8% Slope	8 to 15% Slope	0 to 15% Slope
		Soil > 20" Deep	Soil > 20" Deep	Soil 10" to 20" Deep
*Low	0 – 65	Full Rate	Full Rate Split Application	Half Rate
*Moderate	66 – 120	Full Rate	Half Rate	Half Rate
*High	121 – 300	Half Rate	Half Rate	Half Rate
*Severe	> 300	No Application	No Application	No Application

Rating	Soil Test P Index	Rocks >10" in diameter which cover >3% of the soils surface and <8% slope
*Low	0 – 65	Half Rate
*Moderate	66 – 120	Half Rate
*High	121 –	Half Rate

	300	
*Severe	> 300	No Application

* See Severe Rating-No Application below. Check for specific site characteristics which may deem the field inadequate for manure application.

Waste Application Rates

Full Rate – Not to exceed the Nitrogen requirement of the crop and the following P_2O_5 rates:

1. 200 lbs P_2O_5 per acre when surface applied.
2. 300 lbs P_2O_5 per acre when application is by sprinkler irrigation and managed to prevent runoff from field.
3. 400 lbs P_2O_5 per acre if injected below the soil surface or surface applied and incorporated within 7 days.

Half Rate – Not to exceed the Nitrogen requirement of the crop and the following P_2O_5 rates:

1. 100 lbs P_2O_5 per acre when surface applied.
2. 150 lbs P_2O_5 per acre when application is by sprinkler irrigation and managed to prevent runoff from field.
3. 200 lbs P_2O_5 per acre if injected below the soil surface or surface applied and incorporated within 7 days.

Split Application – Not to exceed the Nitrogen requirement of the crop

Application will be no more than ½ the allowed P_2O_5 rate per application at least 30 days apart.

Severe Rating- No Application

Do not apply manure or organic by-products in the following situations. Reference the Published County Soil Survey or Section II of the local NRCS Field Office Technical Guide.

- To areas within 100 feet of a perennial stream, pond, well, or sinkhole, unless an established buffer is present. The width of the buffer will be used as a set back distance for application purposes. The buffer must meet the requirements for design and maintenance established in the NRCS buffer standard and specification.
- To areas within 50 feet of an intermittent stream unless an established buffer is present. The width of the buffer will be used as a set back distance for application purposes. The buffer must meet the requirements for design and maintenance established in the NRCS buffer standard and specification.
- To fields with > 15% slope.

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- **To soils with less than 10 inches in depth to parent material.**
- **On soils that are frequently flooded.**
- **On soils that are frozen, snow covered, or water saturated.**
- **On soils where the rock fragments in the surface layer are 3 to 10 inches in diameter and exceed 50% by weight.**
- **On soils where the rock fragments in the soil surface layer are > 10" in diameter and exceed 25% by weight.**
- **On soils where the rock fragments are > 10 inches in diameter which covers > 3% of the soil surface and the slope is > 8%.**
- **On areas eroding at levels greater than the soil loss tolerance, "T", from water erosion or active gullies unless following a conservation plan that will reduce erosion below "T". Use current Oklahoma NRCS erosion prediction methods.**
- **On soils that are occasionally flooded. However, waste may be applied between June 20 and September 20 on soils classified as occasionally flooded. Manure may also be applied to soils classified as occasionally flooded between February 1 and April 20 if the area is established to cool season grasses 4 inches in height at the time of application.**